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Analysis of Gas Line Antifreeze, Windshield Washer Fluid, and Ethylene Glycol Antifreeze

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ANALYSIS OF GAS LINE ANTIFREEZE, WINDSHIELD WASHER FLUID AND ETHYLENE GLYCOL ANTIFREEZE

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Antifreeze materials are added to protect water from freezing in vehicle gasoline tanks, in reservoirs of windshield washer fluid, and in vehicle radiators.

In gasoline tanks, gas line antifreeze products (commonly called dry gas) containing the active ingredients methanol (methyl alcohol) or isopropanol (isopropyl alcohol) are used. The alcohol mixes with traces of water and prevents the water from freezing in the gasoline tank or in gasoline lines.

In windshield washer fluids, methanol is commonly used. Manufacturers usually do not declare a percentage of alcohol, but labels generally state that the product will protect from freezing down to -20 or -25F. According to published freezing point values (1) a mixture of 33% methanol and 67% water will not freeze above -20F. These products may contain a cleaning agent that may also help to lower the freezing point.

Ethylene glycol antifreeze is used in vehicle radiators. Manufacturers recommend using at least a mixture of 50% ethylene glycol and 50% water. The labels state that the mixture will protect from freezing down to -25F.

There are no standards for the amount and type of active ingredients used in these three types of products. All products were tested by analyzing for type and percentage of active ingredient and determining if they met their label claims. If the freezing point stated on the label was inconsistent with the alcohol content (1) a freezing point determination was made.

Connecticut Statutes require that products containing methanol show a warning statement on the label (2).

In this study we examined 19 gas line antifreeze products, 13 windshield washer fluids, and six ethylene glycol antifreeze products.

Methods

Samples were collected by an inspector of the Connecticut Department of Consumer Protection and analyzed at The Connecticut Agricultural Experiment Station. Analyses for alcohols and ethylene glycol were by gas chromatography. A Varian Model 920 with a thermal conductivity detector and a Poropak Q stainless steel column was used. The temperature of the column was 150C and of the injection port was 170C. The nitrogen carrier gas flowed at a rate of 40 milliliters per minute. Freezing points were determined by cooling the sample with liquid nitrogen and observing freezing.

Results

The brands of the 19 gas line antifreeze products tested and the type and percentage of alcohol found are in Table 1. Fourteen contained only methanol, two only isopropanol, and two a mixture of methanol and isopropanol. All products contained essentially all active ingredient. The two products with a mixture of methanol and isopropanol (numbers 9 and 10), however, were misbranded under Connecticut Regulations since methanol was not declared as an ingredient and a warning statement about its toxicity was not shown.

The brands of the 13 windshield washer fluids and the type and percentage of alcohol found are in Table 2. All samples stated on the label that they would protect from freezing to -20 or -25F, i.e., would not freeze at a temperature above -20 or -25F. Based on actual alcohol content and published freezing point values, sample numbers 1, 3, 11, and 12 would freeze above -20F. Actual freezing point determinations, however, showed these four products did not freeze above -20F. The addition of cleaning materials such as detergents probably depressed the freezing point sufficiently to justify the label claim that they would not freeze above -20F.

Sample number 8 correctly declared on the label that it contained 35% methanol. Sample number 5 contained 100% methanol, and the label on this product states that below 0F a 50% mixture in water should be used. We calculated that such a mixture would prevent freezing at least to -36F.

The six brands of ethylene glycol antifreeze and the percentage of ethylene glycol found are in Table 3. All contained at least 95% ethylene glycol. Calculations show that a 50% solution of all six products in water would not freeze above -30F. Thus the label claims that they would not freeze above -30F are correct.

Conclusions

All 19 gas line antifreeze products contained essentially all methanol. The label claims for 13 windshield washer fluids that they would not freeze above a stated temperature were correct. The label claims for six ethylene glycol radiator antifreeze products also were correct.

Acknowledgments

Analyses were by Vipin Agarwal and Sunrae McLean. Samples were collected by Mark Guilietti under the direction of Lois Bryant, Chief, Product Safety Division, Connecticut Department of Consumer Protection.

References

1. Handbook of Chemistry and Physics, 61st edition, 1980-1981. CRC Press, Boca Raton, FL.
2. General Statutes of Connecticut revised to January 1, 1985, section 21a-335(e)(C).

Table 1. Alcohol Content of Gas Line Antifreeze.

Sample Number	Brand	% Alcohol & Type
1	BG gas line antifreeze & dryer	98 - Isopropanol
2	Caldor 100% gas line antifreeze	98 - Methanol
3	Christy dry gas	99 - Methanol
4	Auto Value gas line antifreeze	99 - Methanol
5	Berkebile 2 + 2 gas line antifreeze	98 - Methanol
6	Crown gas line dryer antifreeze	98 - Methanol
7	Master gas line antifreeze	99 - Methanol
8	Monarch gas line antifreeze	99 - Methanol
9	NAPA Mac's fuel system treatment	40 - Methanol & 60 - Isopropanol[a]
10	NAPA Mac's thermo-aid	40 - Methanol & 60 - Isopropanol[a]
11	PAHNOL gas line antifreeze & gas tank dryer	97 - Methanol
12	Penn-Fride gas line antifreeze	98 - Methanol
13	Prestone gas dryer & gas line antifreeze	99 - Methanol
14	Q7 gas line antifreeze	99 - Isopropanol
15	Rickel gas line antifreeze	97 - Methanol
16	Savo gas line antifreeze	97 - Methanol
17	Shell gas line antifreeze dryer	99 - Methanol
18	Sure-Thaw gasoline antifreeze & dryer	97 - Methanol
19	Uni-Guard Ice-O-Dry	98 - Isopropanol

a. Product misbranded since methanol not declared on label.

Table 2. Alcohol Content of Windshield Washer Fluids.

Sample Number	Brand	% Alcohol & Type	Claimed Protection To[a]
1	Caldor windshield washer antifreeze	30 - Methanol	-20F
2	CVS windshield washer & solvent	37 - Methanol	-20F
3	Crown windshield washer fluid	31 - Methanol	-25F
4	Kleen-Bright windshield washer antifreeze	37 - Methanol	-25F
5	NAPA windshield washer solvent	100 - Methanol[b]	[c]
6	Our Own summer/winter windshield wash (Bradleea)	38 - Methanol	-25F
7	PAHNOL windshield washer antifreeze cleaner	37 - Methanol	-20F
8	Pathmark antifreeze windshield washer	40 - Methanol	-25F
9	Prestone windshield washer antifreeze/ cleaner	35 - Methanol	-20F
10	Rickel windshield washer	36 - Methanol	-20F
11	Serv-U windshield washer	30 - Methanol	-20F
12	Uni-Guard windshield washer antifreeze	30 - Methanol	-20F
13	UNIFIDE windshield washer fluid	43 - Methanol	-20F

a. All met their claims.
b. This product is to be diluted with water before use.
c. No claim.

Table 3. Ethylene Glycol Content of Radiator Antifreeze.

Sample Number	Brand	% Ethylene Glycol
1	Autovalue antifreeze coolant	96
2	Conoco antifreeze/coolant	95
3	NAPA antifreeze/coolant	95
4	Quaker State antifreeze coolant	95
5	Texaco antifreeze coolant	95
6	Zerex antifreeze/coolant (Conoco)	95